



Designation: D 4849 – 02a

## Standard Terminology Relating to Yarns and Fibers<sup>1</sup>

This standard is issued under the fixed designation D 4849; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This standard is a compilation of terminology developed by Committee D-13.58 on Yarns and Fibers.

1.1.1 This terminology, mostly definitions, is unique to fibers and yarns used in the textile industry. Terms that are generally understood or adequately defined in other readily available sources are not included.

1.1.2 Subcommittee D13.58 has jurisdictional responsibility for every item in this standard. The standards in which the terms and definitions are used are listed by number after the definition. The wording of an entry cannot be changed without the approval of 13.58 subcommittee. Any changes approved by the subcommittee and main committee are then directed to subcommittee D13.92 on Terminology for subsequent changes or additions to Terminology D123.

1.1.3 This terminology standard is not all inclusive of the terms under the jurisdiction of subcommittee D13.58. Other terminology standards under the jurisdiction of subcommittee D13.58 are D 3888, D 4466, and D 4848.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 123 Terminology Relating to Textiles<sup>2</sup>

D 3888 Terminology Relating to Open-End Spinning<sup>3</sup>

D 4466 Terminology for Multicomponent Textile Fibers<sup>3</sup>

D 4848 Force, Deformation and Related Properties of Textiles<sup>3</sup>

### 3. Terminology

3.1 Alphabetical listings of terms with subcommittee 13.58 jurisdiction and attribution for each term.

**American grain count**, *n*—a direct yarn numbering system for expressing linear density, equal to the mass in grains per 120 yards of sliver or roving. **D 2260**

**beam**, *n*—*in textiles*, a large spool containing many ends of yarn wound parallel, and used for such purposes as weaving or warp knitting. **D 2258**

**beam set**, *n*—*in textiles*, one or more beams of yarn in a single shipment to be further processed together for a specific end use. **D 2258**

**bench marks**, *n*—marks placed on a specimen to define gage length, that is, the portion of the specimen that will be evaluated in a specific test. **D 76**

**boundary friction**, *n*—friction at low sliding speeds (0.02 m/min or less) where lubrication occurs under thin-film lubricant conditions. **D 3412**

**broken filament**, *n*—*in multifilament yarn*, breaks in one or more filaments. **D 3990**

**bulk shrinkage**, *n*—a measure of potential stretch and power of stretch yarns or a measure of bulk of textured-set yarns. **D 4031**

**bunch**, *n*—a defect in a yarn characterized by a segment not over 6 mm ( $\frac{1}{4}$ in.) in length that shows an abrupt increase in diameter caused by more fibers matted in this particular place. (See **slug**, **slub**.) **D 2255**

**cable twist**, *n*—the construction of cabled yarn, cord, or rope in which each successive twist is in the opposite direction to the preceding twist; an S/Z/S or Z/S/Z construction. **D 1423**

**calibrate**, *v*—to determine and record the relationship between a set of standard units of measure and the output of an instrument or test procedure.

DISCUSSION—This term is also commonly used to describe the checking of previously marked instruments, an operation more properly described as a description of verification. **D 76**

**capacity**, *n*—*for tensile testing machines*, the maximum force for which the machine is designed.

DISCUSSION—Capacity is the maximum force the tester-frame and the drive system can exercise on the specimen without inadmissible deformations of the tester-frame, etc. Within its capacity, there are available load-cells with different full-scale ranges which may be chosen to select an appropriate full-scale range for a special test. **D 76**

**case**, *n*—*in textiles*, a shipping unit, usually a carton, box, bale, or other container holding a number of yarn packages. **D 2258**

**clamp**, *n*—that part of a testing machine used to grip the specimen by means of suitable jaws. **D 76**

**cockles**, *n*—*in yarns*, irregular, thick, uneven lumps. **D 2255**

**coefficient of friction**, *n*—the ratio of the tangential force that

<sup>1</sup> This terminology is under the jurisdiction of ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.58 on Yarns and Fibers.

Current edition approved April 10, 2002. Published August 2002. Originally published as D 4849–88. Discontinued June 1992 and reinstated as D 4849–02.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 07.01

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 07.02

is needed to maintain uniform relative motion between two contacting surfaces to the perpendicular force holding them in contact. **D 3108, D 3412**

**coefficient of variation unevenness**, *n*—*in textiles*, the standard deviation of the linear densities over which unevenness is measured expressed as a percentage of the average linear density for the total length within which unevenness is measured. (See also **unevenness** and **mean deviation unevenness**.) **D 1425**

**cohesive force**, *n*—*in a textile strand*, the force required to overcome fiber cohesion as the strand is being reduced in linear density.

DISCUSSION—In dynamic tests, cohesive force is the force required to maintain drafting in a roving, silver, or top. In static tests, cohesive force is measured while a test specimen is held in a fixed position between two slowly separating clamps. **D 2612, D 4120**

**colorfastness**, *n*—the resistance of a material to change in any of its color characteristics, to transfer its colorant(s) to adjacent materials, or both, as the result of exposure of the material to any real or simulated environment that might be encountered during processing, storage, use or testing of the material. **D 204**

**commercial allowance**, *n*—an arbitrary value equal to the commercial moisture regain plus a specified allowance for finish, used with the mass of scoured, oven-dried yarn, to compute (1) yarn linear density, (2) the commercial or legal mass of a shipment or delivery of any specific textile material (see also **commercial moisture regain**) or (3) the mass of a specific component in the analysis of fiber blends **D 1907, D 2494**

**commercial mass**, *n*—billed mass as determined by a generally accepted method or as agreed upon between the purchaser and supplier.

DISCUSSION—The basis for determining the commercial mass of a shipment of yarn or manufactured fibers is generally one of the following: (1) *CAS Basis (commercial allowance with scoured material)*—the mass of oven-dry fiber or yarn after scouring by definite prescribed methods plus the mass corresponding to its *commercial allowance*, (2) *CMRS Basis (commercial moisture regain with scoured material)*—the mass of oven-dry fiber or yarn after scouring by definite prescribed methods plus the mass corresponding to its *commercial moisture regain*, (3) *CMRU Basis (commercial regain with unscoured material)*—the mass of unscoured oven-dry fiber or yarn plus the mass corresponding to its *commercial regain*, (4) *UN Basis (unadjusted net)*—the mass of the unscoured fiber or yarn with no adjustment for the amount of moisture or finish, or both. **D 2494**

**cone**, *n*—*in textiles*, (1) a yarn holder or bobbin of conical shape used as a core for a yarn package of conical form, also called a cone core. (2) the yarn package obtained when yarn is wound upon a cone core. **D 2258**

**constant-rate-of-extension type tensile testing machine (CRE)**, *n*—*in tensile testing*, an apparatus in which the pulling clamp moves at a uniform rate, and the force-measuring mechanism moves a negligible distance with increasing force, less than 0.13 mm (0.005 in.) **D 76**

**constant-rate-of-load tensile testing machine (CRL)**, *n*—*in tensile testing*, an apparatus in which the rate of increase of the force is uniform with time after the first 3 s and the

specimen is free to elongate, this elongation dependent on the extension characteristics of the specimen at any applied force. **D 76**

**constant-rate-of-traverse tensile testing machine (CR)**, *n*—a testing machine in which the pulling clamp moves at a uniform rate and the force is applied through the other clamp which moves appreciably to actuate a force-measuring mechanism, producing a rate of increase of force or extension that is usually not constant and is dependent upon the extension characteristics of the specimen. **D 76**

**container**, *n*—a receptacle designed to hold a material, or to give integrity to the material.

DISCUSSION—The term container in textiles may include bales, cartons and other shipping containers. **D 3333**

**core-spun yarn**, *n*—a compound structure in which a filament or strand serves as an axis around which a cover of either loose fiber or a yarn is wound.

DISCUSSION—(1) *General*—in yarn testing, when the core and cover in this type of compound structure need to be separated, for testing of either component, the methods used should not compromise the physical properties of the component to be evaluated: and (2) *Specific*—as a sewing thread, the means by which this compound structure is made will not allow the core and cover to be readily separated without compromising the physical attributes of each component. Hence, the sewing thread should be evaluated as a compound structure. **D 204**

**cotton count**, *n*—an indirect yarn numbering system generally used in the cotton system equal to the number of 840-yd lengths of yarn per pound. **D 1059, D 2260**

**cotton system**, *n*—a spinning system adapted to fibers less than 65 mm (2.5 in.) in length.

DISCUSSION—This system usually employs flat-top cards and may use roll and other drafting assemblies on intermediate processes and spinning machines. **D 2645**

**cover**, *n*—*in yarns*, the outside layer of fibers that form the surface of a yarn. **D 2255**

**covered yarn**, *n*—a compound structure which contains distinguishable inner and outer fibrous elements which can be different. **D 204**

**CRE**—abbreviation for constant-rate-of-extension. **D 76**

**crimp**, *n*—*in a textile strand*, the undulations, waviness, or succession of bend, curls, or waves in the strand induced either naturally, mechanically, or chemically.

DISCUSSION—Crimp has many characteristics, among which are its amplitude, frequency, index, and type. In test method D 3937, crimp is characterized by a change in the directional rotation of a line tangent to the fiber as the point of tangent progresses along the fiber. Two changes in rotation constitutes one unit of crimp. **D 3937**

**crimp**, *n*—*in a yarn*, the undulations, waviness, or succession of bends, curls, or waves in the yarn induced either naturally, mechanically, thermal, or chemically. **D 6774**

**crimp contraction**, *n*—an indicator of crimp capacity or a characterization of a yarn's ability to contract under tension. **D 4031, D 6774**

**crimp development medium**, *n*—*for testing of textured yarn*,

an environment that allows the temporary set of fiber crimp to be overcome and that allows the filaments to assume their permanently set configuration. **D 4031**

**crimp frequency, *n***—in *manufactured staple fibers*, the number of crimps or waves per unit length of extended or straightened fiber. **D 3937**

**crimp index, *n***—an indirect measure of the amplitude of the crimp.

**DISCUSSION**—Crimp index is calculated as the difference in distance between two points on the fiber as it lies in an unstretched condition in one plane and the distance between the same two points when the fiber is straightened under a specified tension expressed as a percentage of the unstretched distance. To improve reproducibility, the unstretched distance may be measured under a specified, very low tension to align the fiber in one plane. **D 3937**

**crimp recovery, *n***—a measure of the ability of a yarn to return to its original crimped state after being subjected to tension. **D 4031**

**CRL**—abbreviation for constant-rate-of-loading. **D 76**

**CRT**—abbreviation for constant-rate-of-traverse. **D 76**

**cut, *n***—in *asbestos and glass yarns*, the number of 100-yd lengths of yarn per pound; an indirect yarn numbering system. **D 1059, D 2260**

**cut, *n***—in *wool yarns*, the number of 300-yd lengths of yarn per pound; an indirect yarn numbering system. **D 1059, D 2260**

**denier, *n***—the unit of linear density, equal to the mass in grams of 9000 m of fiber, yarn, or other textile strand that is used in a direct yarn numbering system. (See also **linear density**) **D 1059, D 2260**

**direct yarn numbering system, *n***—a system that expresses the linear density of yarn in mass per unit length.

**DISCUSSION**—The preferred units of measurements for the direct yarn measuring system are grams and meters. Tex (weight in grams for 1000 metres) and Denier (weight in grams for 9000 metres) are recommended to show linear density in the direct numbering system. These can be calculated by dividing the mass of a yarn by its length. Conversion factors to convert between direct and indirect numbering systems can be found in Standard Tables D 2260. **D 1059, D 1907, D 2260**

**direction of twist, *n***—the right or left direction of the helix formed in a twisted strand as indicated by superimposition of the capital letter “S” or “Z.”

**DISCUSSION**—Yarn has an S twist, when the yarn is held in a vertical position, the visible spirals or helices around the central axis conform in direction of slope to the central portion of the letter “S”, and Z twist if the invisible spirals or helices conform in direction of slope to the central portion of the letter “Z”. When two or more yarns, either single or plied are twisted together, the letters “S” and “Z” are used in a similar manner to indicate the direction of the last twist inserted. **D 1422, D 1423**

**draw ratio (DR), *n***—the relation of the final length per unit mass to original length per unit mass of a material resulting from drawing. **D 3218, D 5344**

**draw texturing, *n***—for *processing thermoplastic fibers*, the simultaneous or sequential process of drawing and imparting crimp, thus producing increased molecular orientation and increased bulk.

**DISCUSSION**—The drawing and texturing stages may occur in separate, usually consecutive, zones of a machine (sequential draw texturing) or together in the same zone (simultaneous draw texturing). **D 5344**

**drawing, *n***—in *textile processing*, the process of stretching or attenuating a material to increase the length per unit mass.

**DISCUSSION**—This process orients the molecular chains in the length direction of a monofilament or partially oriented yarn. **D 3218, D 5344**

**effective carriage mass, *n***—in *CRL-type tensile testing machine*, the force actually applied to a specimen by the mass of the carriage, plus any added masses. **D 76**

**effective fiber length, *n***—in *vibroscope test for linear density*, that portion of the fiber free to vibrate between fixed supports or holders. **D 1577**

**effective gage length, *n***—in *tensile testing*, the estimated length of the specimen subjected to a strain equal to that observed for the true gage length.

**DISCUSSION**—The effective gage length can be calculated using the following equation:

$$G_E = G_N \times E_N/E_T \quad (1)$$

where:

$G_E$  = effective gage length

$G_N$  = nominal gage length

$E_N$  = percent elongation based on the nominal gage length, and

$E_T$  = percent elongation based on the true gage length. **D 76**

**elastomeric yarn, *n***—a nontextured yarn which can be stretched repeatedly at room temperature to at least twice its original length and which after removal of the tensile force will immediately and forcibly return to approximately its original length.

**DISCUSSION**—The elastic properties of yarn are produced by the use of filaments, or a core, made from polymers having a special chemical composition or molecular structure, for example, filaments made from spandex or from cut or extruded rubber. **D 3106**

**electrostatic decay half-life, *n***—in *textiles*, the time in minutes for the maximum voltage induced on the textile to be reduced to one half of the maximum voltage by the various decay mechanisms: conduction and ionization of the air. **D 4238**

**electrostatic propensity, *n***—the capacity of a nonconducting material to acquire and hold an electrical charge by induction (by means of corona discharge) or by triboelectric means (rubbing with another material). **D 4238**

**end, *n***—an individual silver, roving, yarn, or cord.

**DISCUSSION**—For yarns, one or more continuous, multiple parallel lengths of yarn which may be wound on a yarn package or beam. For example, two lengths of yarn wrapped parallel on a single bobbin constitute two yarn ends, likewise, one thousand lengths of yarn wrapped parallel on a single beam constitutes one thousand yarn ends. **D 2258**

**entanglement, *n***—the extent or degree to which the filaments in a yarn are interlocked and cannot be readily separated.

**DISCUSSION**—There are two kinds of entanglements, intermediary (loose) node and hard (tight) node. Intermediary nodes are pulled out easily under tension or separated by a needle. Test method D 4724 measures the presence of hard nodes in which the interlocking or interlacing is compact pulling the yarn bundle together. **D 4724**

**evaluator**, *n*—a part of, or an attachment to, an unevenness testing instrument, which automatically gives an estimate of  $R_u$ . **D 1425**

**fabric package**, *n*—a length of fabric in a form suitable for handling, storing, or shipping.

**DISCUSSION**—Fabric packages may be unsupported, such as when folded in cases, or supported, such as on tubes, bolts, or creels. Fabric packages are frequently referred to as rolls or pieces. **D 2258**

**fiber beard**, *n*—*in length testing of fibers*, fibers caught randomly on a comb which are subsequently straightened and parallelized without stretching or damaging. **D 3513**

**fiber chip**, *n*—*in manufactured textiles*, staple fibers that are massed together as a unit and that maintain a single geometry or alignment. **D 3937**

**fiber cohesion**, *n*—in textiles, the resistance to separation of fibers in contact with one another.

**DISCUSSION**—This resistance is due to the combined effects of the surface characteristic, length, crimp, finish, and linear density of the fibers. Cohesion should not be confused with adhesion or sticking together as in a glutinous substance. **D 2612, D 4120**

**filament yarn**, *n*—a yarn composed of (continuous) filaments assembled with or without twist. **D 3822, D 4724**

**final twist**, *n*—the number of turns per unit length in a single yarn component of a plied yarn or the plied yarn component of a cabled yarn as the component lies in the more complex structure. (syn. “as-is” twist) **D 1423**

**frayed**, *adj*—*in textiles*, a worn condition characterized by damaged yarn surfaces, projecting yarn ends, hairiness, etc. **D 5647**

**friction**, *n*—the resistance to the relative motion of one body sliding, rolling, or flowing over another body with which it is in contact.

**DISCUSSION**—There are two frictional properties exhibited between any pair of surfaces: static friction and kinetic friction. Test Methods D 3108 and D 3412 both measure the coefficient of friction for kinetic friction. **D 3108, D 3412**

**fundamental resonant frequency**, *n*—*in linear density testing*, the lowest frequency at which free oscillations can exist in a fiber tensioned between two fixed points. **D 1577**

**fuzz**, *n*—untangled fiber ends that protrude from the surface of a yarn or fabric.

**DISCUSSION**—Fuzz should not be confused with “cover”. **D 2255**

**fuzzy**, *adj*—characterized by a hairy appearance due to broken fibers or filaments. (Syn. hairiness) **D 5647**

**grain**, *n*—*in yarn spinning*, a direct yarn numbering system for sliver, top or roving, equal to the mass in grains of 120 yds. (See **American grain count**) **D 2260**

**grain**, *n*—*in measuring mass*, 1/7000 lb avoirdupois **D 2260**

**greige thread**, *n*—undyed or unfinished sewing thread in the state following final plying or equivalent step in a processing

sequence, such as extruding, texturizing or braiding. **D 204, D 3823**

**grex**, *n*—an obsolete direct numbering system for fiber yarn or other textile strand equal to the mass in grams per 10 000 m **D 1059, D 2260**

**grip**, *v*—*in tensile testing*, to hold, grasp, or secure, for example, to grip the specimen by the jaws of the clamps. **D 76**

**growth**, *n*—an increase in one or more dimensions of an object or a material. **D 204**

**hairiness**, *n*—*or yarns*, an overall condition characterized by filaments or fibers protruding from the yarn surface and uniformly distributed along the yarn length. (Compare wild fibers.) **D 5647**

**hawser twist**, *n*—the construction of cabled yarn, cord, or rope in which the single and first-ply twist are in the same direction and the second-ply twist is in the opposite direction, and S/S/Z or Z/Z/S construction. **D 1423**

**heat shrinkage**, *n*—a decrease in one or more dimensions of an object or material exposed to heat. **D 3128**

**indirect yarn numbering system**, *n*—a system that expresses the linear density of yarn in length per unit mass.

**DISCUSSION**—The preferred units of measurements for the indirect yarn measuring system are yards and pounds. Cotton count (number of 840 yard lengths per pound), worsted count (number of 560 yard lengths per pound), metric count (number of 1000 metre lengths per kilogram), woolen run (number of 1600 yard lengths per pound) and number of yards per pound are commonly used in the indirect numbering system. These can be calculated by dividing the number of specified lengths of a yarn by its unit of mass. Conversion factors to convert between indirect and direct numbering systems can be found in Standard Tables D 2260 **D 1059, D 1907, D 2260**

**integrator**, *n*—*in textile unevenness testing*, a device that calculates the coefficient of variation unevenness or the mean deviation unevenness.

**DISCUSSION**—The terms “integrator” and “integration” as applied to textile unevenness testing do not imply integration in the strict mathematical sense. The type integrator, linear or quadratic, must be carefully selected depending upon a known irregularity of the material; that is, purely random or purely periodic. **D 1425**

**jaw face**, *n*—*in tensile testing machines*, the surface of a jaw which in the absence of a liner contacts the specimen. **D 76**

**jaw liner**, *n*—*in tensile testing machines*, any material placed between the jaw face and the specimen to improve the holding power of the jaws. **D 76**

**jaws**, *n*—*in tensile testing machines*, the elements of a clamp which grip the specimen. **D 76**

**kinetic friction**, *n*—friction developed between two bodies in motion. (Compare **static friction**.) **D 3108**

**lea**, *n*—*in cotton yarns*, the number of 120-yd lengths of yarn per pound; an indirect yarn numbering system. **D 1059**

**lea**, *n*—*in linen yarns*, the number of 300-yd lengths of yarn per pound; an indirect yarn numbering system. **D 1059 D 2260**

**least count**, *n*—*in tensile testing machines*, the smallest change in the indicated property that can customarily be determined.

**DISCUSSION**—In tensile testing machines with close graduations for force and elongation indications, the least count may be the value of a graduation interval; with open graduations, or with magnifiers for reading, the least count may be an estimated fraction (rarely as fine as 0.1) of a graduation interval; and with verniers, the least count is ordinarily the difference between the scale and vernier graduations measured in terms of scale units. If the indicating mechanism includes a stepped detent, the detent action may determine the least count (See **sensitivity, in mechanical systems**) **D76**

**length between,  $L_b$ ,  $n$** —in *textile unevenness testing*, the length between which unevenness is measured, the equivalent of the length of strand segments weighed in a direct method of measuring unevenness **D 1425**

**length distribution,  $n$** —of *staple fibers*, a graphic or tabular presentation of the proportion or percentage (by number or by mass) of fibers having different lengths. **D 5103, D 5332**

**length within,  $L_w$ ,  $n$** —in *textile unevenness testing*, the length over which unevenness is measured.

**DISCUSSION**—The total length of the strand from which the segments weighed were sampled in a direct method of measuring unevenness. For indirect methods, the maximum value of length within is the tested length from the specific package. **D 1425**

**linear density,  $n$** —for *fiber and yarn*, mass per unit length. **D 861, D 1059, D 1577, D 2260, D 3106, D 3217, D 3822**

**linear integrator,  $n$** —in *textile unevenness testing*, an integrator that operates continuously and reports unevenness for a certain, and unchanging, time past.

**DISCUSSION**—The input to the integrator immediately preceding the moment of taking a reading receives greater “weight” than the prior input, and this “weighting” gradually decreases with the lapse of time. (*Syn. fading memory integrator*) **D 1425**

**loopy, *adj***—a descriptive term for yarns having randomly sized loops of fibers or filaments protruding from the yarn surface.

**DISCUSSION**—Loopiness may or may not be desirable depending on the yarn’s end-use. **D 5647**

**mass,  $n$** —the quantity of matter in a body. (See also **weight**.) **D 4848**

**mean deviation unevenness,  $U$  %,  $n$** —in *textiles*, the average of the absolute values of the deviations of the linear densities of the integrated lengths between which unevenness is measured and expressed as a percentage of the average linear density for the total length within which unevenness is measured. (See also **unevenness, coefficient of variation unevenness**.) **D 1425**

**metric count,  $n$** —an indirect yarn numbering system for sliver roving, and yarn, equal to the number of kilometers per kilogram (1000 m/kg). **D 1059, D 2260**

**modified worsted system,  $n$** —a worsted system for spinning man-made fibers which relies on pin control of fibers during sliver weight reduction, but which bypasses the system of combing required with wool to remove noil. **D 4911**

**monofilament,  $n$** —a single filament which can function as a yarn in commercial textile operations, that is, it must be strong and flexible enough to be knitted, woven, or braided, etc. (see **yarn**.)

**DISCUSSION**—(1) When a monofilament is drawn or in use, it does not fibrillate into (essentially) reticulate multifilaments. (2) A flat polyolefin monofilament can be called a tape yarn. **D 2101, D 3218**

**multiple-length staple fibers,  $n$** —manufactured staple fibers that are two or more times the nominal cut fiber length. **D 3513**

**nep,  $n$** —a tightly tangled knot-like mass of unorganized fibers. Compare nap and pill. **D 2255**

**nominal gage length,  $n$** —in *tensile testing, (General)* the length of a specimen under specified pretension measured from nip-to-nip of the jaws of the holding clamps in their starting position at the beginning of the test, and including any portion of the specimen on contact with bollard or snubbing surfaces. (*Specific 1*), the length of a specimen under specific pre-tension between frets, in instruments where the specimen is not held by clamps, for example, in a vibroscope. (*Specific 2*), the length of a specimen measured between the points of attachment to the tabs while under specified pretension.

**DISCUSSION**—The calculated percentage of elongation based on the nominal gage length may be in error due to extension of that part of the specimen which lies between the jaws of the clamps. **D 76**

**olefin fiber**—a manufactured fiber in which the fiber-forming substance is any long-chain synthetic polymer composed of at least 85 % by weight of ethylene, propylene, or other olefin units, except amorphous (noncrystalline) polyolefins qualify under rubber. **D 3218**

**original length,  $n$** —of *yarns*, the length of the yarn under a specified tension. **D 6774**

**original twist,  $n$** —the twist in a single or plied yarn component of a plied or cabled yarn as the component was before incorporation into the more complex structure. **D 1423**

**overlength staple fibers,  $n$** —manufactured staple fibers that are at least 10 % longer than nominal or average cut length. **D 3513**

**partially oriented yarn,  $n$** —filament yarn in which polymer molecules are only partially aligned.

**DISCUSSION**—Additional drawing of partially oriented yarn results in full orientation of the polymer molecules and optimizes the tensile properties of the yarn. **D 5344**

**polyolefin,  $n$** —any long-chain synthetic polymer composed of at least 85 % by weight of ethylene, propylene, or other olefin units (monomers), except amorphous (non-crystalline) polyolefin qualifying under Rubber 1, as defined by the Federal Trade Commission. (Compare Olefin)

**DISCUSSION**—The generic term olefin has been adopted by the Federal Trade Commission in place of the technically correct term polyolefin. **D 3218**

**polyolefin-material cleanliness,  $n$** —the degree to which a polymer melt is free of filterable particles which remain insoluble in the melt under the specified test condition. **D 3218**

**polyolefin monofilament,  $n$** —as used in *specification D 3218*, a flat single filament of the slit-film type, which can function as a yarn in commercial textile operations. **D 3218**

**quadratic integrator,  $n$** —in *textile unevenness testing*, an



**D 4849 – 02a**

integrator that operates continuously and reports unevenness for the time during which it has been active, giving equal consideration to all portions of the input. (Syn. compensating-memory integrator.) **D 1425**

**radian**, *n*—the plane angle between two radii of a circle which intersects the circumference of the circle making an arc equal in length to the radius.

DISCUSSION—A radian is equal to  $180^\circ$  divided by  $\pi$  and is approximately  $57.3^\circ$ . **D 3108, D 3412**

**residual fiber shrinkage**, *n*—of textured yarns, the shrinkage that remains in a yarn after texturing; the difference between the original length and the length after developed crimp has been removed.

DISCUSSION—The term residual fiber shrinkage is synonymous with the textured yarn manufacturer's term of "shrinkage" or "fiber shrinkage" and is expressed as a percentage of the original length. **D 6774**

**resistance to ultraviolet radiation**, *n*— in polyolefin tape yarn, the time-to-failure of yarns exposed to xenon-arc weathering.

DISCUSSION—In polyolefin tape yarns, the failure criterion for resistance to ultraviolet radiation is the loss of 50 % of the original breaking tenacity. **D 3218**

**response time**, *n*—in tensile testing machines, the time required by the indicating or recording device to reflect an instantaneous change in force, usually 0 to 90 % of full scale. **D 76**

**resultant yarn number**, *n*—the yarn number based on the observed mass per unit length of a plied yarn, a cabled yarn, or a yarn whose number has been changed by processing such as twisting or bulking.

DISCUSSION—A calculated yarn number obtained from yarn number(s) of the components should not be called a resultant yarn number. **D 1244**

**roving**, *n*—a loose assemblage of fibers drawn or rubbed into a single strand, with very little twist. In spun yarn systems, the product of the stage, or stages, just prior to spinning. **D 4120**

**run**, *n*—in the American woolen system, the number of 1600-yd lengths of yarn per pound; an indirect yarn numbering system generally used for yarns spun on the woolen system. **D 1059, D 2260**

**sample skein**, *n*—skein reeled from the package or beam of the laboratory sample, and used in the laboratory as a Source of specimens. **D 2258**

**sensitivity**, *n*—in electronic systems, the minimum change in the input signal that produces a change in the output signal that can be reliably measured. **D 76**

**sensitivity**, *n*—in mechanical systems, the smallest change that can be induced on a material by the system and be reliably measured. (See also **least count**.)

DISCUSSION—Sometimes the term sensitivity is used for the ratio of the response or change induced in the output to a stimulus or change in the input. For this ratio "amplification" is a better term. **D 76**

**sew**, *v*—to unite or fasten with stitches, sewing usually involves a needle and sewing thread. **D 204**

**sewing force**, *n*—the force applied to a sewing thread at the needle eye during penetration of a material by the needle. **D 204**

**sewing thread**, *n*—a flexible, small-diameter yarn or strand, usually treated with a surface coating, lubricant, or both, intended to be used to stitch one or more pieces of material or an object to a material.

DISCUSSION—Sewing threads are primarily made of textile fibers but may be made from such non-textile materials as stainless steel filaments. **D 204, D 3693, D 3823**

**shipment**, *n*—goods or commodities which are transported together as a unit; a quantity of product for which a bill of lading has been signed by the carrier. **D 2494**

**Shipping unit**, *n*—in textiles, any type of packaging used to facilitate the handling and shipping of fibers, yarns and fabrics.

DISCUSSION—Packages can include bales, cartons, and other such containers. **D 3333**

**shrinkage**, *n*—a dimensional change resulting in a decrease in the length of a specimen.

DISCUSSION—In yarn shrinkage testing, shrinkage is usually expressed as a percentage of the length prior to exposure. (See dimensional change). **D 204, D 2102, D 2259, D 3218, D 5104**

**single yarn**, *n*—the simplest strand of textile material suitable for operations such as weaving, knitting, etc.

DISCUSSION—A single yarn may be formed from fibers with more or less twist; from filaments with or without twist; from narrow strips of material such as paper, cellophane, or metal foil; or from monofilaments. A yarn which is either twistless or can be rendered twistless in a single untwisting operation. When twist is present, it is usually all in the same direction. **D 1422, D 1423**

**skein**, *n*—a continuous strand of yarn, wound on a hand or motorized reel. **D 1578, D 1907**

**skein break factor**, *n*—in yarn testing, the comparative breaking force of a skein of yarn adjusted for the linear density of the yarn expressed in an indirect system.

DISCUSSION—A statement of the break factor of the skein must indicate the number of wraps in the skein if this is not otherwise apparent; without information on the number of wraps, a statement of the break factor is meaningless. Skein break factor is frequently given other designations such as lea count constant, lea product, and breaking ratio. **D 1578**

**skein breaking force**, *n*—the force required to rupture a skein of yarn. (See skein strength). **D 1578**

**skein loop-length**, *n*—the inside length of a coil of yarn mounted vertically as measured under a specified force. **D 2259**

**skein shrinkage**, *n*—a measure of true or intrinsic yarn shrinkage not including crimp contraction. **D 4031**

**skein strength**, *n*—the ability or capacity of a skein of yarn to withstand the ultimate tensile force required for rupture. (See skein breaking force). **D 1578**

**sliver**, *n*—a continuous strand of loosely assembled fibers that

is approximately uniform in cross-sectional area and without twist. **D 4120**

**slub**, *n*—an abruptly thickened place in a yarn. (Syn. **lump**, **piecing**, **slough-off**, **slug**. Compare **cockles**) **D 2255**

**specular gloss**, *n*—the relative luminous fractional reflectance of a specimen in the specular direction. **D 3218**

**spun yarn**, *n*—*in a staple system*, a continuous strand of fibers held together by some binding mechanism.

DISCUSSION—The binding mechanism most commonly used with spun yarns is twist. Other mechanisms used are chemical additives, wrapping, entanglement, or combination of these. **D 1422**, **D 1423**

**D 6197**

**stability to thermal oxidation**, *n*—*for polyolefin monofilaments*, the time-to-failure, when polyolefin monofilaments are exposed to circulating air, at 125°C.

DISCUSSION—The failure criterion for thermal oxidation stability is the mechanical breakdown described in specification 3218. **D 3218**

**standard polyolefin monofilament**, *n*—*as used in specification D 3218*, a flat polyolefin strand, approximately 0.05 mm (2 mil) thick by 2.5 mm (100 mil) wide and oriented with a draw ratio between 5:1 and 7:1.

DISCUSSION—The strand is produced through slitting an extruded polyolefin film, and when drawn or in use does not fibrillate into essentially reticulate multifilaments. **D 3218**

**staple**, *n*—natural fibers or cut lengths from filaments.

DISCUSSION—Commercial shipments of staple from manufactured fibers should not include cut waste or short fibers of variable length made by breaking tow or top. The term “staple (fiber)” is used in the textile industry to distinguish natural or cut length (fibers) from filaments. **D 3513**

**static friction**, *n*—friction developed between two touching bodies at the time one body starts to move relative to another. (Compare **kinetic friction**.) **D 3108**

**stick-slip**, *n*—a phenomenon occurring when boundary lubrication is deficient, manifested by alternate periods of sticking and slipping of the surfaces in contact.

DISCUSSION—At the specified sliding speed in yarn friction testing, stick-slick cycles are long enough that they can be readily recorded. During sticking, the frictional force slowly rises to a peak value, at which the slipping occurs with the frictional force rapidly decreasing to a minimum value. **D 3412**

**strand**, *n*—(1) a single fiber, filament, or monofilament. (2) an ordered assemblage of textile fibers having a high ratio of length to diameter and normally used as a unit, including slivers, rovings, single yarns, plied yarns, cords, braids, ropes, etc. **D 1425**, **D 4849**

**strand irregularity**, *n*—*in textiles*, variation in a property along a strand. **D 1425**

**stretch yarns**, *n*—a generic term for a filament or spun yarn having a high degree of potential elastic stretch.

DISCUSSION—Stretch yarns are generally produced by an appropriate combination of deforming, heat setting and development treatments to attain elastic properties. **D 6774**

**tape yarn**, *n*—a yarn of a flat, tape-like character produced by

slitting an extruded film. **D 3218**

**tare**, *n*—the mass of all external and internal packing materials (including bobbins, tubes, etc.) of a case, bale, or other type of container. **D 2494**

**tensile testing machine**, *n*—an apparatus designed to impart, or transmit, force/extension, or stress/strain, to a material and to measure the effect of the action. (See also **constant-rate-of-extension tensile testing machine**, **constant-rate-of-load tensile testing machine**, and **constant-rate-of-traverse tensile testing machine**.) **D 76**

**test skein**, *n*—a small skein which has a prescribed length of yarn and is used for the determination of linear density or breaking force, or both. **D 76**

**tex**, *n*—the unit of linear density, equal to the mass in grams of 1000 meters of fiber, yarn, or other textile strand, that is used in a direct yarn numbering system. (See also **linear density** and **direct yarn numbering system**.) **D 204**, **D 861**, **D 1059**, **D 1577**, **D 2260**

**thick place**, *n*—a yarn defect characterized by a diameter greater than that of the adjoining segments and extending for 6 mm (1/4 in.).

DISCUSSION—The thick place is normally caused by a greater number of fibers per yarn cross section than usual. (See also **thin place**.) **D 2255**

**thin place**, *n*—a yarn defect characterized by a segment that is substantially (at least 25 %) smaller in diameter than the average diameter of the yarn.

DISCUSSION—A thin place may be of any length. (See also **thick place**.) **D 2255**

**thread holder**, *n*—the support package on which a sewing yarn is wound.

DISCUSSION—This support package enables sewing yarn to be securely placed for subsequent transportation, storage and utilization at the point of use. The support package may be in the form of a cone, spool, tube, or bobbin. **D 204**, **D 3693**

**ticket number**, *n*—*in sewing thread*, the designator assigned to a sewing thread to designate its approximate linear density.

DISCUSSION—The ticket number is an indicator of the approximate amount of fiber present. The smaller the number, the finer the thread (lesser amount of fiber); and the larger the number, the coarser the thread (greater amount of fiber). This designator represents a size variation which will range from three numbers apart up to 50 numbers apart. The narrow range is important so that there is not a wide disparity in the linear density of the sizes indicated by a single designator. The wide range of numbers designate heavier (coarser) yarns where difference in yield is less of a critical factor relative to linear density. **D 204**, **D 3823**

**time of integration**, *n*—*in yarn evenness testing*, the time during which a point-to-point integrator stays switched on. **D 1425**

**time-to-break**, *n*—the time interval during which a specimen is under prescribed conditions of tension and is absorbing the energy required to reach maximum force.

DISCUSSION—Time-to-break does not include the time require to remove slack from the specimen. **D 76**

**top, *n***—*in textiles, (1) worsted process*—a sliver in which the fibers have been parallelized, and usually combed; (2) *manufactured fibers or tow to top process*, a sliver obtained by drafting, along with breaking or cutting a multifilament tow. (see also wool top.) **D 4120**

**total contraction, *n***—*of textured yarns*, the difference between the original length and the length after heat treatment.

DISCUSSION—The term total contraction is sometimes identified as total recovery on some test apparatus and is expressed as a percentage of original length. **D 6774**

**tow, *n***—*in manufactured fibers*, a twistless multifilament strand suitable for conversion into staple fibers or sliver, or for direct spinning into yarn. **D 3822**

**true gage length, *n***—*in tensile testing*, a precise length between well-defined bench marks located on the specimen while under known tension in the unsupported portion between the holding clamps and free from contact with any snubbing surfaces or other sources which could result in non-uniform strain. **D 76**

**twist, *n***—*in textile strands*, the helical or spiral configurations induced by turning a strand about its longitudinal axis.

DISCUSSION—Twist is usually expressed as the number of turns about the axis that are observed in a specified length, either in turns per metre (tpm) or turns per inch (tpi). **D 204, D 1422, D 1423, D 204**

**twist factor, TF, *n***—the product obtained when the twist expressed in turns per centimetre is multiplied by the square root of the yarn number expressed in tex.

$$\text{Twist factor (TF)} = \text{tpcm} \times \sqrt{T}^{1/2} \quad (2)$$

where:

$\sqrt{L}^{1/2}$  = yarn number expressed in tex.

Twist multiplier and twist factor are a measure of the twist “hardness” of yarn because they are approximately proportional to the tangent of the angle between fibers on the outer yarn surface and the axis of the yarn; the larger this angle, the harder the twist. Furthermore, this angle is a function of both the twist content (turns per unit length) and the number of fibers per yarn cross section (yarn number). Hence, twist content alone cannot provide a measure of the twist hardness of a yarn. Twist multiplier and twist factor are proportional to each other and differ only in the units used. The two are related by the following equations.

$$TF = k \times TM \quad (3)$$

$$k = 277.29/\sqrt{L}^{1/2}$$

Where:

$\sqrt{L}^{1/2}$  = length in yards of the hank used to define the indirect yarn number of the type,

*N* = hanks/lb. In particular for cotton system,

*k* = 9.567 and Eq 2 becomes:

$$TF = 9.567 \times TM \quad (4)$$

**D 1422, D 1423**

**twist multiplier, (TM), *n***—the quotient of the twist expressed in turns per inch and the square root of the yarn number in an indirect system.

$$\text{Twist multiplier (TM)} = \text{tpi}/\sqrt{N}^{1/2} \quad (5)$$

where:

$\sqrt{N}^{1/2}$  = yarn number in an indirect system, the cotton system, unless otherwise specified.

**twist take-up, *n***—the change in length of a yarn or other textile strand caused by twisting, expressed as a percent of the original untwisted length. **D 1423**

**typp, *n***—an obsolete indirect yarn numbering system equal to the number of 1000-yd lengths per pound. **D 1059, D 2260**

**unevenness, *n***—*in textiles*, variation in the linear density of a continuous strand or of a portion of a strand. (See also **coefficient of variation unevenness, mean deviation unevenness.**) **D 1425**

**unit length of instrument, *L<sub>c</sub>*, *n***—*in textile unevenness testing*, the length of strand being measured between the sensing elements at any moment. **D 1425**

**water retention, *n***—the moisture remaining in and on a material after a specified mechanical treatment.

DISCUSSION—In test method D 2402, water retained by fiber masses includes water absorbed from the prevailing atmosphere, water imbibed during (not following) immersion, and water adhering to fiber surfaces after being subjected to 1000 times normal gravitational acceleration (g) for 5 min. Water retention is traditionally based on the oven-dried fiber mass, as, as such, is a type of moisture pick-up. **D 2402**

**woolen-spun, *adj***—of, or pertaining to, material produced by the woolen system of yarn spinning as distinct from materials made by the worsted system of spinning. (Compare **worsted-spun.**)

DISCUSSION—Woolen-spun yarns do not necessarily contain any wool. **D 2644**

**woolen system, *n***—a spinning system employing a minimum of drafting and producing yarns of low-bulk density.

DISCUSSION—Roving is produced by rub aprons in the condenser section at the front of a roller-top card. There is no roller drafting, or other intermediate process between carding and spinning. **D 2644**

**worsted count, *n***—an indirect yarn numbering system in the worsted system equal to the number of 560-yd lengths per pound. (*Syn.* English worsted count. Compare **woolen run.**) **D 1059, D 2260**

**worsted system, *n***—a spinning system adapted to fibers 50 to 225 mm (2 to 9 in.) in length.

DISCUSSION—This system employs roller-top cards, pin drafters, or gills, and widely spaced roller drafting assemblies on roving and spinning frames. Wool yarns spun on the worsted system are usually combed; worsted-spun manufactured fiber yarns are not combed. **D 2645**

**wrap angle, *n***—*in yarn friction testing*, the cumulative angular contact of the test specimen against the friction-inducing device, expressed in radians. **D 3108, D 3412**

**yarn, *n***—a generic term for a continuous strand of textile fibers, filaments, or material in a form suitable for knitting, weaving, or otherwise intertwining to form a textile fabric. **D 1422, D 1423**

**yarn appearance, *n***—the visual effect obtained by viewing a





sample of yarn wound with a designated traverse on a black board of designated size. **D 2255**

**yarn fault**, *n*—in textile strands, a change in thickness sufficient to be visible without magnification. **D 6197**

DISCUSSION—In test method D 6197, a visible change in thickness, such as a abnormal thick and thin place in the yarn resulting in a large change in yarn diameter or any foreign matter affixed to or spun into the yarn, such as a nep, is considered to be a fault. Thick faults are reported as either major or minor depending on the combination of length and diameter. The most accepted criterion for major faults (infrequent thick places) is 250 to 400 % larger than yarn diameter. The minor faults (frequent thick places) are 100 to 150 % larger than yarn diameter and 1.0 to 40-mm (0.04 to 1.5 in.) long. The thin place classes are arranged and considered separately. The criteria for thin places may vary with the manufacturers, but will generally fall in the category of less than 30 % of diameter and greater in length than 10 mm. **D 6197**

**yarn fault count**, *n*—the number of yarn faults per specified length of product. **D 6197**

**yarn number**, *n*—a measure of the linear density of a yarn expressed as “mass per unit length,” or “length per unit mass” depending upon the yarn numbering system used. (Syn. yarn count.) (See yarn numbering system.) **D 204, D 1059, D 1907, D 2260**

**yarn numbering system**, *n*—a system that expresses the size of a yarn as a relationship between its length and associated mass. (See **direct yarn numbering system** and **indirect yarn numbering system**) **D 1059, D 1907, D 2260**

**yarn package**, *n*—a length or parallel lengths of yarn in a form suitable for handling, storing, or shipping. **D 2258**

DISCUSSION—Packages may be unsupported, such as skeins or cakes, or supported having various winding patterns, such as bobbins, cops, cones, pirns, spools, or tubes. In yarns, the word package designates the smallest unit that can be separated from the shipment without cutting or unwinding the yarn, not a small group of packages. Even a small box containing a dozen spools is treated, for sampling purposes, as a case. **D 2258**

*ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.*

*This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.*

*This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).*